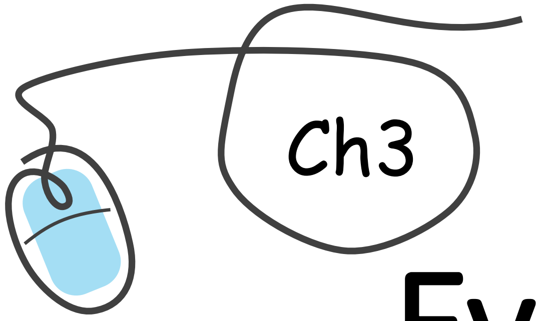


Ch3

Evaluating Hardware: For Home and Work

Dr. Jian-Ren Hou

Final Project

- We have 77 students.
  - 3 groups
    - 7 members
  - 7 groups
    - 8 members
- Choose your teammate carefully.

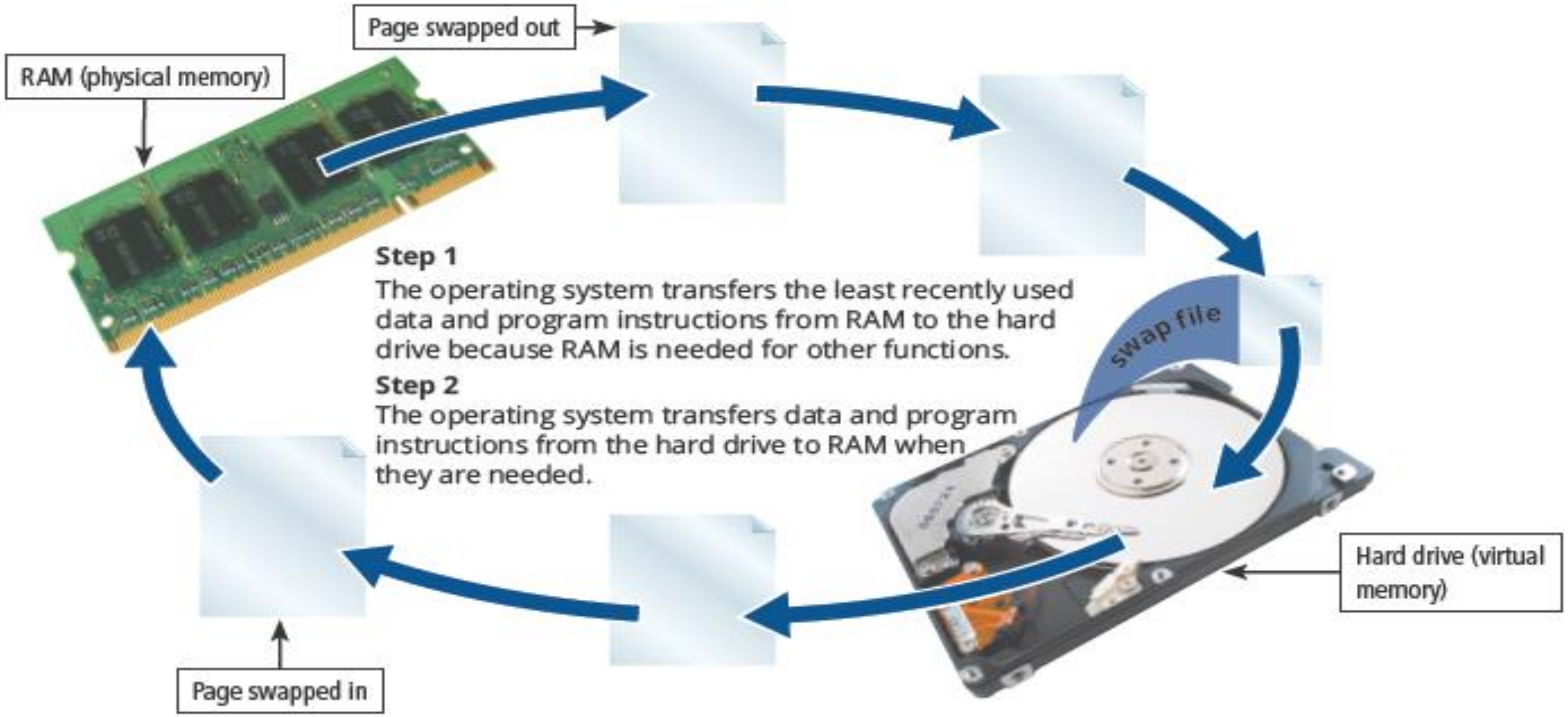
- Register your team
  - E-mail to TAs
  - Before the midterm

  - 陳俞君
    - R36124104@gs.ncku.edu.tw

Considering Computer Operating Systems (1 of 6)

- **Hardware** refers to the device itself and its components, such as wires, cases, switches, and electronic circuits.
- **Components** of computer hardware contain various types of hardware:
  - ✓ Memory
  - ✓ Storage devices
  - ✓ CPU
  - ✓ Input and output devices
  - ✓ Communication devices

Considering Computer Operating Systems (2 of 6)


Page swapped out
RAM (physical memory)
swap file
Hard drive (virtual memory)
Page swapped in

Step 1
The operating system transfers the least recently used data and program instructions from RAM to the hard drive because RAM is needed for other functions.

Step 2
The operating system transfers data and program instructions from the hard drive to RAM when they are needed.

Figure 3-2 How a computer might use virtual memory.

Considering Computer Operating Systems (3 of 6)

- A **processor core** is a unit on the processor with the circuitry necessary to execute instructions.
- Processors with more cores perform better. (not always true)
- A processor with multiple cores is a **multi-core processor**.
- **Computer memory** is responsible for holding data and programs as they are being processed by the CPU.
- An **operating system** and other apps require a certain amount of **RAM** to function properly.
- When more apps run simultaneously, more RAM will be required.
- The area of the hard drive temporarily used to store data that cannot fit in RAM is called a **swap file**, or **paging file**.
- Using virtual memory may decrease your computer’s performance.

CPU1
CPU3
CPU5
CPU7
CPU2
CPU6
CPU4
CPU8
CPU9
CPU0
高通CPU
联发科CPU
苹果CPU

Considering Computer Operating Systems (4 of 6)

RAM

- It is the **temporary** storage location.
- It is stored on one or more chips connected to the main circuit board of the computer (**the motherboard**).
- It is **volatile memory**.
- The **motherboard** is a circuit board inside a computer that contains the microprocessor, the computer memory, and other internal devices.

ROM

- It is the **permanent** storage location.
- It is stored on a chip that contains **BIOS** connected to the main circuit board of the computer (**the motherboard**).
- It is **non-volatile memory**.
- Computer manufacturers update the instructions on the ROM chip, which are referred to as **firmware**.

Considering Computer Operating Systems (5 of 6)

Table 3-1 Types of RAM.

Type of RAM	Description	Volatile or Nonvolatile
Dynamic RAM (DRAM)	Memory needs to be constantly recharged or contents will be erased.	Volatile
Static RAM (SRAM)	Memory can be recharged less frequently than DRAM but can be more expensive than DRAM.	Volatile
Magneto-resistive RAM (MRAM)	Memory uses magnetic charges to store contents and can retain its contents in the absence of power.	Non volatile
Flash memory	Fast type of memory that is typically less expensive than some other types of RAM and can retain its contents in the absence of power.	Non volatile

Considering Computer Operating Systems (6 of 6)

Table 3-2 Factors to consider in buying a computer.

Consideration	Questions
Platform	• Do I need to use software that requires a specific platform? • Does the computer need to be compatible with other devices I own that use a particular platform?
Hardware	• Do I require specific hardware to perform my intended tasks? • How much data and information do I plan to store on the computer?
Hardware specifications	• Will the tasks I perform or software I want to run require certain hardware specifications?
Form factor	• Will I be using this computer in one location, or will I need to be mobile?
Add-on devices	• What additional devices will I need to perform my intended tasks?

Which Type of Computer Is Right For You?

- Table 3-3 Evaluating system requirements.

Specification	Recommended Solution
Different processor requirements	Identify the program or app with the greater processor requirement and select a computer with a processor that meets or exceeds the requirement.
Different memory requirements	Identify the program or app with the greater memory requirement and select a computer with a memory type and capacity that meets or exceeds this requirement. Computers with as little as 4 GB of memory are great for basic web browsing and very basic productivity tasks, while computers with as much as 32 GB are often used for virtual reality applications, high-end gaming, and other intensive tasks.
Different storage requirements	Add the storage requirements for each program or app you want to use, and select a computer with a storage capacity that exceeds the sum of all storage requirements.
Other differing hardware requirements	In most cases, identify the program or app with the greater requirement and select a computer that at least meets or exceeds this requirement.

Input and Output Devices (1 of 2)

- A **scanner** is an input device that converts an existing paper image into an electronic file that you can open and work with on your computer.
- **3-D scanners** can scan three-dimensional objects.
- **Scanner** can be used to scan a printed document to edit it using an app on your computer.
- A **printer** creates hard copy output on paper, film, and other media.
- A printer can be linked to a computer wirelessly, over a network, or with a cable.

Input and Output Devices (2 of 2)

Table 3-4 Types of printers.

Type of Printer	Description
Inkjet printer	Prints by spraying small dots of ink onto paper
Laser printer	Uses a laser beam and toner to print on paper
Multifunction device	Also called an all-in-one printer; can serve as an input device by copying and scanning as well as an output device by faxing and printing
Mobile printer	Small, lightweight printer that is built into or attached to a mobile device for mobile printing
Plotter	Large-format printer that uses charged wires to produce high-quality drawings for professional applications such as architectural blueprints; plotters draw continuous lines on large rolls of paper
3–D printer	Creates objects based on computer models using special plastics and other materials

Install and Evaluate Hardware (1 of 2)

- **Peripheral devices** over the wireless network need installation directly to your device through a port.
- Some devices, called **Plug-and-Play** devices, will begin functioning properly as soon as they are connected to your computer.
- A **device driver** is a program that allows your computer or device to issue controls to a separate device, such as a printer, monitor, or video card.
- To connect a **wireless device** to your computer, follow the installation instructions that come with the device.

Install and Evaluate Hardware (2 of 2)

- The processor’s **clock speed** measures the speed at which it can execute instructions.
- A **cycle** is the smallest unit of time a process can measure.
- The efficiency of a CPU is measured by **instructions per cycle**.
- The **bus width** determines the speed at which data travels.
- A **benchmark** is a test run by a laboratory or other organization to determine processor speed and other performance factors.

Secure IT: Reducing Hardware Risks

- Use a can of compressed air to clean the keyboard of any dirt and debris.
- Extreme temperatures or humidity can damage electronics.
- An **uninterruptible power supply** is a device that maintains power to computer equipment in the event of an interruption in the primary electrical source.
- A **surge suppressor** is a device that prevents power fluctuations from damaging electronic components.

Backup
Normal
Overload
POWER

Figure 3-23 Uninterruptible power supply.

Internal, External, and Cloud-Based Storage Solutions (1 of 3)

- When using a computer, the most common storage medium is the internal **hard drive** and can either store data magnetically or use solid state storage.
- Internal hard drives are installed on the computer you are using.
- An **external hard drive** can add storage capacity to your computer.
    - Magnetic hard disk drives (HDDs) typically have greater storage capacity.
    - A **solid-state drive** (**SSD**) is faster and more durable than magnetic drives.

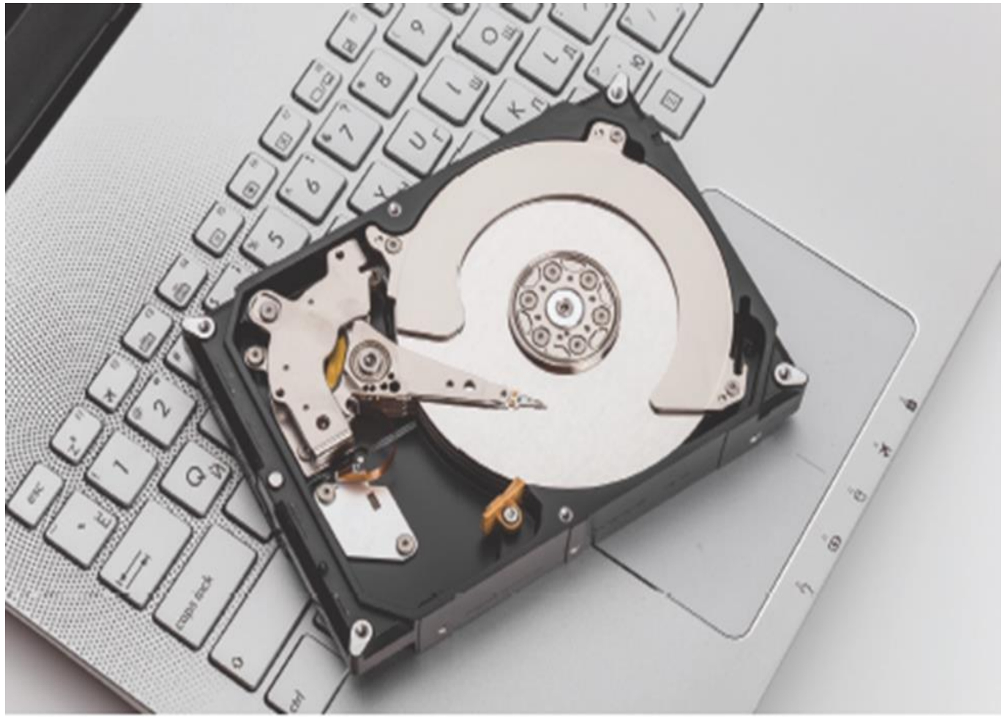


Figure 3-26 Hard disk drive.

NVMe SSD
960 PRO
SAMSUNG

SanDisk
Ultra
3D SSD
SanDisk

Internal, External, and Cloud-Based Storage Solutions (2 of 3)

- **Optical media** use laser technology for storage and playback and include CDs, DVDs, and Blu-ray discs.
- Optical media were once widely used to distribute installation files for programs and apps, but saving files to optical media requires special software or capabilities within the the operating system.
- Instead of optical discs, **USB flash drives**, **external hard drives**, and cloud storage are now more commonly used to transport files.

Internal, External, and Cloud-Based Storage Solutions (3 of 3)

- **Cloud storage** involves storing electronic files on a remote server connected to the Internet, not on a local computer, and is called **storing data** on the cloud.
- It enables the storage of files remotely on servers that could be any part of the world.
- Storing files on and retrieving files from cloud storage requires only a computer or mobile device with an Internet connection.
- Cloud storage companies host and maintain the servers and provide access to your files.

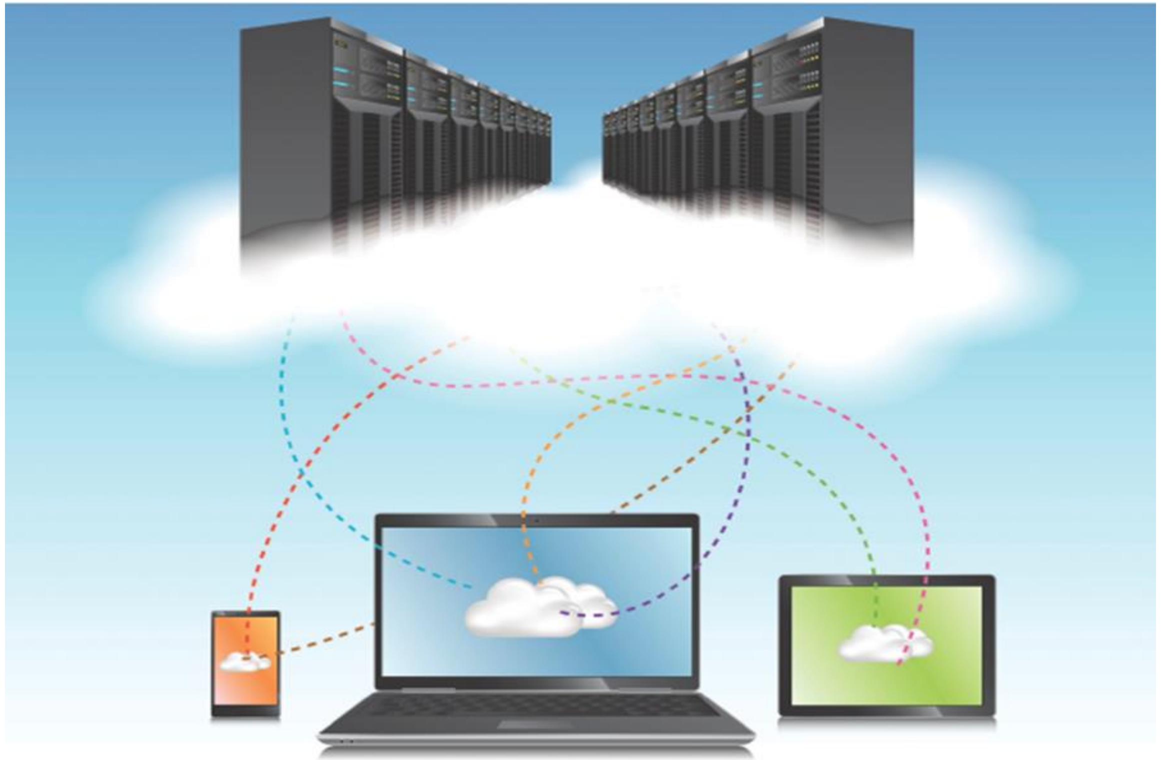


Figure 3-28 Cloud storage.

Network Hardware

- Devices on a network, also called **nodes**, include computers, tablets, mobile phones, printers, game consoles, and smart home devices.
- Most networks also include additional components, such as **hubs**, **switches**, and **routers**.
  - A **hub** is a device that provides a central point for cables in a network and transfers all data to all devices.
  - A **switch** is similar to a hub in that it provides a central point for cables in a network.
  - A **router** is a device that connects two or more networks and directs, or routes, the flow of information along the networks.
- A **modem** is a communications device that connects a communications channel, such as the Internet, to a sending or receiving device, such as a computer.
- For a computer to connect to a network, it should have a **network interface card**.

RT SWITCH
1
3
5
7
2
4
6
8

Inside the Case (1 of 4)

- **Processor chips** for laptops, desktops, and servers can generate quite a bit of heat, which could cause the chip to malfunction or fail.
- Heat sinks, liquid cooling technologies, and cooling pads are used to help further dissipate processor heat.
- A **heat sink** is a small ceramic or metal component with fins on its surface that absorbs and disperses heat produced.
- **Liquid cooling technology** uses a continuous flow of fluid, such as water and glycol, in a process that transfers the heated fluid away.
- A **cooling pad** rests below a laptop and protects the computer from overheating.

Inside the Case (2 of 4)

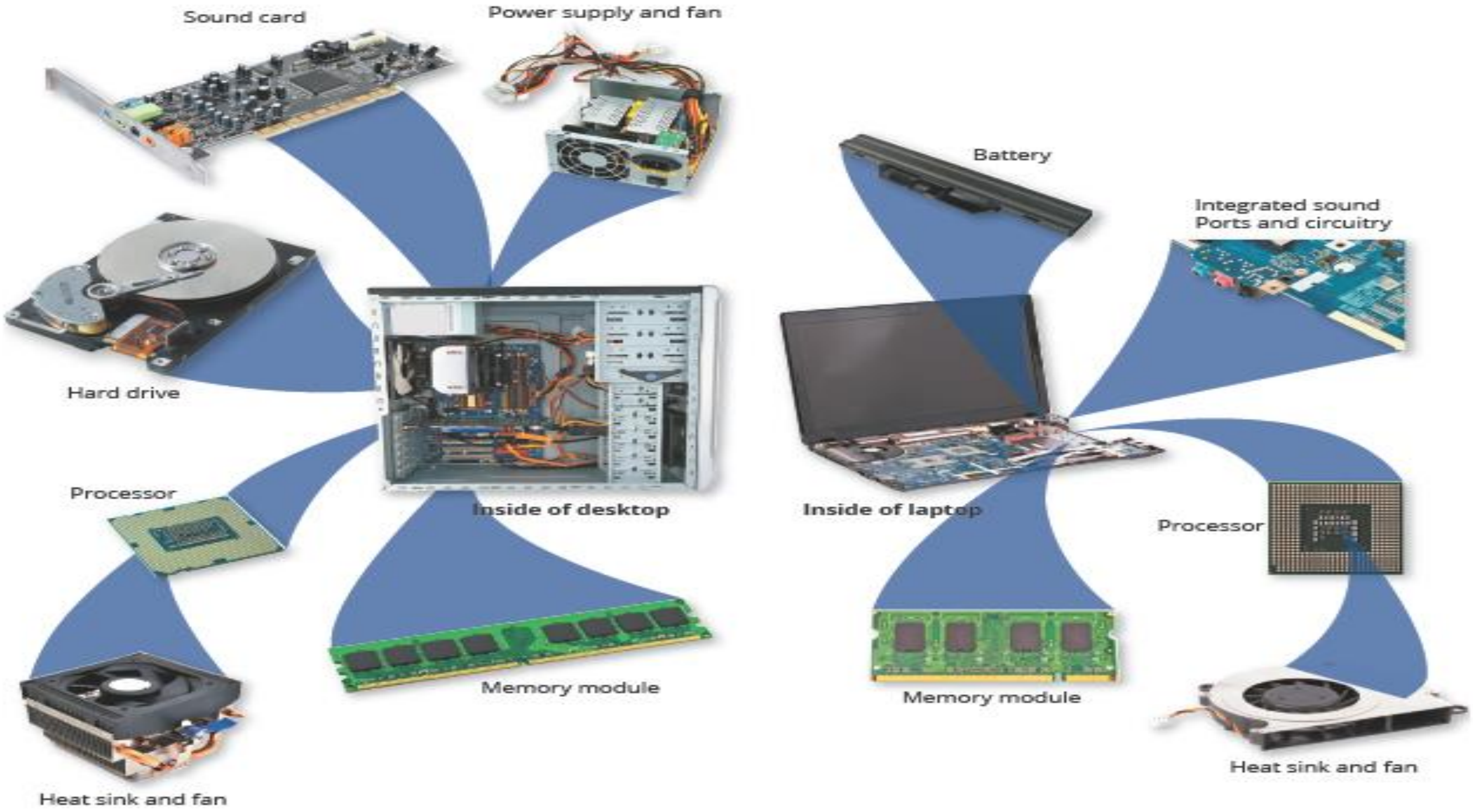

Sound card
Power supply and fan
Hard drive
Inside of desktop
Processor
Heat sink and fan
Memory module
Battery
Integrated sound
Ports and circuitry
Inside of laptop
Processor
Memory module
Heat sink and fan

Figure 3-30 Typical components of a higher-end desktop and laptop.

Inside the Case (3 of 4)

- Many electronic components, such as the processor and memory, attach to the **motherboard**; others are built into it.

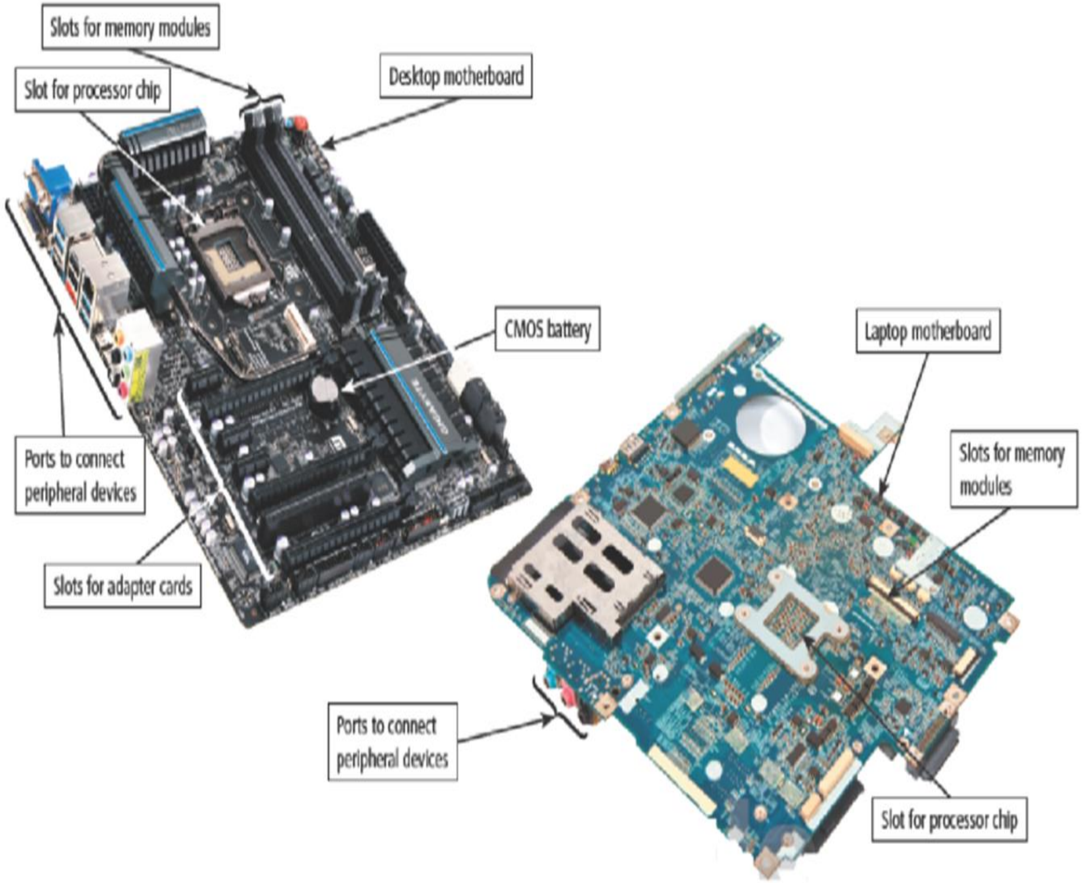
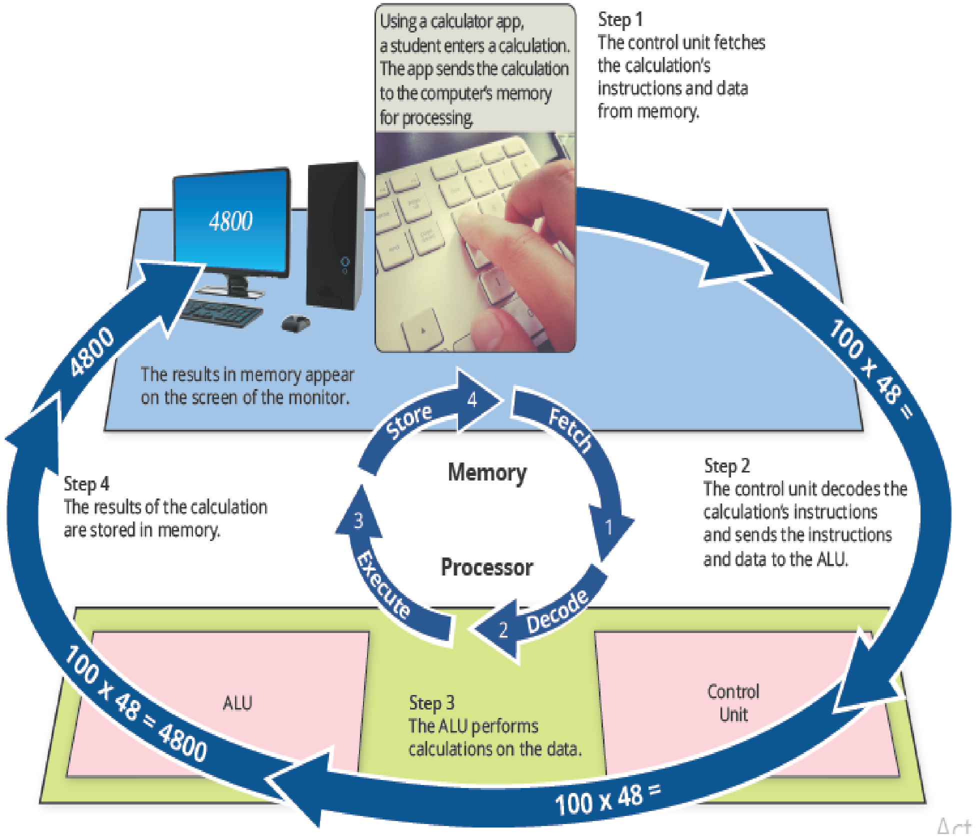

Slots for memory modules
Slot for processor chip
Desktop motherboard
CMOS battery
Ports to connect peripheral devices
Slots for adapter cards
Laptop motherboard
Slots for memory modules
Ports to connect peripheral devices
Slot for processor chip

Figure 3-31 A desktop and laptop motherboard.

Inside the Case (4 of 5)

A processor repeats a set of four basic operations, which comprise a **machine cycle.**

- **Fetching** is the process of obtaining a program or an application instruction or data item from memory.
- **Decoding** refers to the process of translating the instructions into signals the computer can execute.
- **Executing** is the process of carrying out the commands.
- **Storing**, in this context, "writing" means writing the result to memory (not to a storage medium).



Using a calculator app, a student enters a calculation. The app sends the calculation to the computer's memory for processing.

Step 1
The control unit fetches the calculation's instructions and data from memory.

Step 2
The control unit decodes the calculation's instructions and sends the instructions and data to the ALU.

Step 3
The ALU performs calculations on the data.

Step 4
The results of the calculation are stored in memory.

The results in memory appear on the screen of the monitor.

Figure 3-32 The steps in the machine cycle.

Ethics and Issues: Dispose of Hardware Responsibly (1 of 2)

- **E-waste** is electronic waste from discarded digital devices.
- It often contains toxic metals, like lead and mercury which contaminate the ground and water supply, causing harm to the environment.
- Three responsible methods for disposing of e-waste:
  - ✓ Send it to a recycling facility
  - ✓ Donate it to a charity or other nonprofit organization
  - ✓ Bring it to a technology store or firm

Figure 3-35 Electronic recycling center.

Ethics and Issues: Dispose of Hardware Responsibly (2 of 2)

An initiative called **Sustainable Electronics Management** (SEM) promotes the reduction of e-waste.

Table 3-8 SEM action steps.

Step	Action	Description
1	Buy Green	When purchasing new electronic equipment, buy only products that have been designed sustainably
2	Donate	Donate used but still functional equipment to a school, charity, or nonprofit organization
3	Recycle	Send equipment to a verified used electronics recycling center

Thank You